C.

THEORETICAL AND PRACTICAL

ARITHMETIC:

Being a Complete System,

CONTAINING

MENTAL EXERCISES, THE CANCELING PRINCIPLE,

A SHORT METHOD OF MULTIPLYING,

AND OTHER IMPROVEMENTS, ADAPTED TO INTEREST THE PUPIL AND RENDER HIM THOROUGHLY ACQUAINTED WITH THE SCIENCE.

ALSO,

BOOK-KEEPING AND BUSINESS ITEMS.

"LABOR CONQUERS ALL THINGS."

DESIGNED FOR

PUBLIC SCHOOLS, ACADEMIES, AND PRIVATE LEARNERS.

BY REV. D. CLINTON BENJAMIN.

PART I.

NEW YORK:
PUBLISHED BY THE AUTHOR.
1852.

CONTENTS.

SIMPLE NUMBERS.

RECOMMENDATIONS.

Extract from a letter from A. Watson, Principal of Kinderhook Academy.

KINDERHOOK, May 14th, 1851.

Rev. and Dear Sir: I have looked over, with as much attention as my time and duties would permit, your MS. Arithmetic. It undoubtedly displays perfect familiarity with the subject, an acquaintance with many of the modern abbreviations in the science, some new methods of shortening labor (in multiplication) which I had not seen before, and, in general, a perspicuous and correct style.

A. WATSON.

From Martin Van Buren, Ex-President of the United States.

With Mr. Watson I am well acquainted, and think him eminently qualified to judge of the merits of Mr. Benjamin's work. Mr. Benjamin is also well known to me, and is a gentleman well entitled to respect.

Lindenwald, Nov. 6th, 1851. M. VAN BUREN.

I hereby certify that I have examined the manuscript Arithmetic of Rev. D. C. Benjamin, and believe the work to be one of peculiar excellence and great merit. His course throughout is to lead the mind of the student by explanation and examples to a thorough knowledge of this important subject. He has interspersed many facts which are of great utility to every person who wishes to become familiar with every-day business transactions. I shall most earnestly recommend its introduction into the schools of this town as soon as published.

PETER I. PHILIP, *Town Superintendent of Common Schools for the Town of Kinderhook.*

December 26th, 1851.

I have examined the "Practical Arithmetic" of the Rev. Mr. Benjamin, and am pleased with it. Its mode of reasoning is such as is sanctioned by nature and the most correct usage. Its rules are brief, yet expressed in clear and simple language. I believe it will meet the approval of practical teachers.

HENRY CARVER.

[Mr. Carver occupies a high standing as a school teacher in Valatie, Columbia county, N. Y.]

From the Secretary of the Board of Directors of Common Schools for the Township of Charlestown, Chester county, Penn., March 11th, 1847.

REV. DR WITT C. BENJAMIN—

Sir: Having examined your Arithmetic in manuscript, I am prepared cheerfully to recommend it as a work well adapted to promote the interests of those who wish to pursue that branch of knowledge. A prevailing objection to works of the kind heretofore has been that almost uniformly they have been wanting in simplicity, or susceptibility of being readily understood by the learner. This objection has been greatly obviated by the method you have adopted in your work. The remarks, notes, and references are well adapted to afford a clear perception of the principles of Arithmetic and the relation of numbers. The new rules you have introduced in multiplication and various other parts of the work, while they will be easily learned, are admirably adapted for shortening operations. I shall be pleased to see the work in general use in our schools.

Yours respectfully, JONATHAN REES.

From Rev. Allen Johns, Member of the Philadelphia Annual Conference of the Methodist Episcopal Church.

REV. DR WITT C. BENJAMIN—

Dear Sir: Having examined your manuscript Arithmetic, I fully concur in the opinion expressed above, and cordially unite in recommending the work to public notice.

ALLEN JOHNS.

Sadsburyville, Chester Co., Penn., April 14, 1848.

ARITHMETIC.

1. What is Arithmetic; and what does it include?

A. It is the science of numbers; and includes the art of applying them to practical purposes.

2. How *many*, and *what* are its principal or fundamental rules?

A. Five: Numeration, Addition, Subtraction, Multiplication, and Division.

NUMERATION.

3. What does Numeration teach?

A. It teaches the art of expressing and reading numbers by figures.

4. What are the figures made use of to express numbers?

A. 1 (one), 2 (two), 3 (three), 4 (four), 5 (five), 6 (six), 7 (seven), 8 (eight), 9 (nine), 0 (cipher or nought).

5. How do figures increase in value from the right to the left?

A. In ten-fold ratio.

6. How then do you enumerate?

A. By beginning at the right, and saying units, tens, hundreds, thousands, tens of thousands, hundreds of thousands, millions, tens of millions, hundreds of millions, &c.

7. What place does the figure 1 occupy standing alone?

A. I can say only units, without going beyond it: it therefore must occupy the place of units: it is a figure 1, and therefore must be one unit.

8. What place does the figure 2 occupy, when it stands at the left of the 1; thus, 21?

A. I have to say units, tens, to get to it: it therefore must occupy the place of tens: it is a figure 2, and there-

fore must be 2 tens or 20 (twenty), and standing at the left of the 1 must taken with it make 21 (twenty-one).

9. What place does the figure 3 occupy when written at the left of 21; and how is the whole number read?

A. It occupies the place of hundreds; and the whole number is read 321 (three hundred and twenty-one).

10. What place does the figure 4 occupy when written at the left of 321; and how is the whole number read?

A. It occupies the place of thousands; and the whole number is read 4321 (four thousand three hundred and twenty-one).

11. What place does the figure 5 occupy when written at the left of 4321; and how is the whole number read?

A. It occupies the place of tens of thousands; and the whole number is read 54321 (fifty-four thousand, three hundred and twenty-one).

12. What place does the figure 6 occupy when written at the left of 54321; and how is the whole number read?

A. It occupies the place of hundreds of thousands; and the whole number is read six hundred fifty-four thousand, three hundred and twenty-one; thus, 654321.

13. What place does the figure 7 occupy when it stands at the left of 654321; and how is the whole number read?

A. It occupies the place of millions; and the whole number is read 7654321 (seven millions, six hundred and fifty-four thousand, three hundred and twenty-one).

14. What place does the figure 8 occupy when it stands at the left of 7654321; and how is the whole number read?

A. It occupies the place of tens of millions; and the whole number is read 87654321 (eighty-seven millions, six hundred fifty-four thousand, three hundred and twenty-one).

15. What place does the figure 9 occupy when it stands at the left of 87654321; and how is the whole number read?

A. It occupies the place of hundreds of millions; and the whole number is read 987654321 (nine hundred eighty-seven millions, six hundred fifty-four thousand, three hundred and twenty-one).

16. Repeat the NUMERATION TABLE (*English*).

Hundreds of Millions.	Tens of Millions.	Millions.	Hundreds of Thousands.	Tens of Thousands.	Thousands.	Hundreds.	Tens.	Units.
9	8	7	6	5	4	3	2	1

17. How do you read after hundreds of millions?

A. Thousands of millions, tens of thousands of millions, hundreds of thousands of millions, billions, trillions, quadrillions, quintillions, sextillions, septillions, octillions, nonillions, decillions, undecillions, &c., as in the following example:

Quadrillions.	Trillions.	Billions.	Millions.	Units.
783,427	378,264	782,642	487,364	873,462

18. Write down forty-eight.

A. 48.

19. Write down eighty-six.

A. 86.

20. Write down ninety-four.

A. 94.

21. Write down one hundred and sixty.

A. 160.

22. Write down one thousand two hundred and sixteen.

A. 1216.

23. Write down four thousand eight hundred and sixty-three.

A. 4863.

24. Write down twenty three thousand five hundred and ninety-five.

A. 23595.

25. Write down two millions, seven hundred thirty-nine thousand, eight hundred and forty-seven.

A. 2739847.

26. What do you do when there is a deficiency?

A. Supply it in the order with a cipher or ciphers, as

the case demands. Thus, to write down three hundred and seven, it requires one cipher to supply the deficiency, and to write down three thousand and seven, two ciphers are required, as in the following examples: 307 (three hundred and seven)—3007 (three thousand and seven).

REMARKS.

REMARK 1.—The invention of figures to express numbers is ascribed to the Arabs, and is said to have been introduced into Europe by the Moors, in the year of our Lord 991.

REM. 2.—Each of the characters employed, with the exception of the tenth, expresses a particular number, and is called a significant figure or a digit. The tenth character, or 0 (cipher), is insignificant, and used to supply vacancies occurring among significant figures. When placed at the right of a significant figure it increases its value ten-fold; because figures increase in value from the right towards the left in a ten-fold ratio. Thus, I unit removed to the place of tens equals 10.

REM. 3.—A figure in the place of units possesses its simple value; in each of the other places it has what is termed a local value. A figure in the place of tens possesses ten times its simple value, and in the place of hundreds, one hundred times its simple value, &c.

REM. 4.—The invention of letters to express numbers is attributed to the Romans. It possesses advantages over the method of expressing numbers by words, but it is of less importance than the Arabic method of expressing them by figures. It is still in use, however, to a limited extent, and should therefore be learned.

ROMAN TABLE.

Roman.	Arabic.	By Words.	Roman.	Arabic.	By Words.
I	1	One.	XIV	14	Fourteen.
II	2	Two.	XV	15	Fifteen.
III	3	Three.	XVI	16	Sixteen.
IV	4	Four.	XVII	17	Seventeen.
V	5	Five.	XVIII	18	Eighteen.
VI	6	Six.	XIX	19	Nineteen.
VII	7	Seven.	XX	20	Twenty.
VIII	8	Eight.	XXX	30	Thirty.
IX	9	Nine.	XL	40	Forty.
X	10	Ten.	L	50	Fifty.
XI	11	Eleven.	LX	60	Sixty.
XII	12	Twelve.	LXX	70	Seventy.
XIII	13	Thirteen.	LXXX	80	Eighty.

Roman.	Arabic.	By Words.
XC	... 90	...Ninety.
C	...100	...One hundred.
CC	...200	...Two hundred.
CCC	...300	...Three hundred.
CCCC	...400	...Four hundred.
D	...500	...Five hundred.
DC	...600	...Six hundred.
DCC	...700	...Seven hundred.
DCCC	.800	...Eight hundred.
DCCCC	.900	...Nine hundred.
M	1000	...One thousand.
MD	1500	...Fifteen hundred.
MDC	1600	...Sixteen hundred.
MM	2000	...Two thousand.
$\overline{V}$	5000	...Five thousand.
$\overline{X}$	10000	...Ten thousand.

MDCCCXLIX. Eighteen hundred and forty-nine.

Remark 5.—There are two methods of enumerating, the English and the French. That of the English has already been given, and the principal difference between it and the French is, that while the English divide numbers into periods of six figures, the French divide them into periods of but three, and after hundreds of millions, instead of reading thousands, tens and hundreds of thousands of millions, proceed immediately to billions, &c. The English method is better adapted to the reading of large numbers; the French is more simple, and in more general use. Both, however, should be committed.

FRENCH NUMERATION TABLE.

Hundreds of Sextillions.	Tens of Sextillions.	Sextillions.	Hundreds of Quintillions.	Tens of Quintillions.	Quintillions.	Hundreds of Quadrillions.	Tens of Quadrillions.	Quadrillions.	Hundreds of Trillions.	Tens of Trillions.	Trillions.	Hundreds of Billions.	Tens of Billions.	Billions.	Hundreds of Millions.	Tens of Millions.	Millions.	Hundreds of Thousands.	Tens of Thousands.	Thousands.	Hundreds.	Tens.	Units.
5	7	6,	2	3	4,	7	8	3,	6	2	4,	3	6	7,	8	7	4,	6	8	7,	4	2	3
Period of Sextillions.			Period of Quintillions.			Period of Quadrillions.			Period of Trillions.			Period of Billions.			Period of Millions.			Period of Thousands.			Period of Units.		

In the example given above, after beginning at the right, and pointing the entire number off into periods of three figures each, we commence at the right and enumerate them, by saying units, tens, &c., until we arrive at the extreme left; then we begin with the left-hand period and read all the figures contained in it, giving them the name of the period to which they belong. Thus, 576 (five hundred and seventy-six) sextillions; then we take up

the next period, and proceed in a like manner, and so on, till we arrive at the period of units. The entire number above is read 576 (five hundred and seventy-six) sextillions, 234 (two hundred and thirty-four) quintillions, 783 (seven hundred and eighty-three) quadrillions, 624 (six hundred and twenty-four) trillions, 367 (three hundred and sixty-seven) billions, 874 (eight hundred and seventy-four) millions, 687 (six hundred and eighty-seven) thousands, 423 (four hundred and twenty-three).

EXAMPLES.

1. Point off, enumerate, and read the following numbers:

(1.) 1327 (one thousand three hundred and twenty-seven).

(2.)	4876	(15.)	678348670374648
(3.)	63468	(16.)	364678073640763
(4.)	74876	(17.)	37642378
(5.)	143782	(18.)	64863784
(6.)	2846379	(19.)	102643
(7.)	1463073	(20.)	6724
(8.)	2758	(21.)	687604
(9.)	647	(22.)	704
(10.)	23468	(23.)	2876364876
(11.)	76387	(24.)	467836782
(12.)	111110	(25.)	87643796874
(13.)	202020	(26.)	78999999999
(14.)	370670		

(27.) 146786384678647864.
(28.) 72146783746876346783.
(29.) 78463764876486742068.

2. Write down in figures the following numbers, expressed in words:

(1.) Three hundred and twenty-six.
(2.) Seven hundred and fourteen.
(3.) Eight hundred and five.
(4.) Thirty-six thousand.
(5.) Forty-eight thousand and sixteen.
(6.) Seventy quintillion, six hundred and forty-seven.
(7.) Ninety-six trillion, two billion, and sixteen.

3. Write down in figures, the following numbers, expressed in letters, after the Roman method:

(1.) XIX. *Ans.* 19. (2.) XX. (3.) LX. (4.) LXXX. (5.) XC. (6.) CC. *Ans.* 200. (7.) CCC. (8.) D. (9.) DCCC. (10.) M. (11.) $\overline{\text{M}}$. *Ans.* 1000000.

REMARK.—A line drawn over any number increases it in value one thousand times.

(12.) $\overline{\text{MM}}\overline{\text{M}}$VI. *Ans.* 8000006. (13.) $\overline{\text{MM}}$V. (14.) MDCCCXLIX.

TABLE EXHIBITING THE LOCAL VALUE OF FIGURES.

Hundreds of Trillions.	Tens of Trillions.	Trillions.	Hundreds of Billions.	Tens of Billions.	Billions.	Hundreds of Millions.	Tens of Millions.	Millions.	Hundreds of Thousands.	Tens of Thousands.	Thousands.	Hundreds.	Tens.	Units.
														4 (four).
													4 (forty).
												4 (four hundred).		
											4 (four thousand).			
										4 (forty thousand).				
									4 (four hundred thousand).					
								4 (four million).						
							4 (forty million).							
						4 (four hundred million).								
					4 (four billion).									
				4 (forty billion).										
			4 (four hundred billion).											
		4 (four trillion).												
	4 (forty trillion).													
4 (four hundred trillion).														

EXAMPLES.

1. What is the value of the figure 3 occupying the place of units? *Ans.* 3.
2. What is the value of the figure 5 occupying the place of tens? *Ans.* 50.
3. What is the value of 8 occupying the place of thousands? *Ans.* 8000.
4. What is the value of 8 occupying the place of tens of thousands? *Ans.* 80000.

5. What is the value of 6 occupying the place of hundreds of thousands? *Ans.* 600000.

6. What is the value of 2 occupying the place of trillions? *Ans.* 2000000000000.

7. What is the value of 3 occupying the place of quadrillions? *Ans.* 3000000000000000.

8. What is the value of 2 in the place of trillions and 7 in the place of thousands? *Ans.* 2000000007000.

9. What is the value of 8 in the place of millions and 3 in the place of hundreds? *Ans.* 8000300.

Late Census of the United States, &c., to exercise the Pupil in Numeration.

What is the population of the State of New York according to the census taken in 1850? *Ans.* 3,097,095. —Of Pennsylvania? *A.* 2,311,681.—Of Ohio? *A.* 1,977,031.—Of Virginia? *A.* 1,421,081.—Of Tennessee? *A.* 1,023,118.—Of Kentucky? *A.* 1,001,496.—Of Massachusetts? *A.* 994,271.—Of Indiana? *A.* 988,734. —Of Georgia? *A.* 878,635.—Of North Carolina? *A.* 868,870.—Of Illinois? *A.* 858,298.—Of Alabama? *A.* 771,659.—Of Missouri? *A.* 684,132.—Of South Carolina? *A.* 668,469.—Of Mississippi? *A.* 592,853.—Of Maine? *A.* 583,088.—Of Maryland? *A.* 583,035.—Of Louisiana? *A.* 500,762.—Of New Jersey? *A.* 488,671. —Of Michigan? *A.* 395,703.—Of Connecticut? *A.* 370,604.—Of New Hampshire? *A.* 317,831.—Of Vermont? *A.* 313,466.—Of Wisconsin? *A.* 304,226.—Of Arkansas? *A.* 209,641.—Of Iowa? *A.* 192,122.—Of Texas? *A.* 187,403.—Of California?* *A.* 150,000.—Of Rhode Island? *A.* 147,555.—Of Delaware? *A.* 91,528. —Of Florida? *A.* 87,387.

What is the population of New York city? *A.* 515,394. —Of Philadelphia? *A.* 409,074.—Of Baltimore? *A.* 169,155.—Of Boston? *A.* 138,788.—Of New Orleans? *A.* 119,493.—Of Cincinnati? *A.* 116,401.—Of Brook-

* Returns were received from California, but they were considered defective, and a new census is ordered.

lyn? *A.* 96,850.—Of Albany? *A.* 50,771.—Of Buffalo? *A.* 42,226.—Of Louisville? *A.* 43,217.—Of Washington? *A.* 40,001.—Of Providence? *A.* 43,062.—Of Charleston? *A.* 42,806.—Of Newark? *A.* 38,885.—Of St. Louis? *A.* 82,744.—Of Rochester? *A.* 36,561.—Of Troy? *A.* 28,785.—Total population of the United States? *A.* 23,218,199.—Number of whites? *A.* 19,618,256.—Of free colored? *A.* 419,786.—Of slaves? *A.* 3,186,157.

What is the population of England and Wales according to the census taken in 1851? *A.* 17,905,831.—Of Scotland? *A.* 2,870,784.—Of Ireland? *A.* 6,515,794.—Of islands in British seas? *A.* 142,916.—Total population of Great Britain and Ireland? *A.* 27,435,325.—Of London? *A.* 2,363 141.

MENTAL EXERCISES IN NUMERATION.

Questions.

1. What figure expresses the number one; as one apple, one inkstand, one chair, &c.?

2. What figure expresses the number eight; as eight marbles, eight cents?

3. How many figures do you employ to express any number larger than nine, and less than one hundred?

4. What figures express twelve?

5. In which place does the second figure from the right stand, in the place of units, or that of tens?

6. In which place, then, does the figure at the right stand?

7. How are 1 ten and 1 unit read? 1 ten and 2 units? 1 ten and 6 units? 1 ten and 7 units?

8. How much are 2 tens? 2 tens and 1 unit? 3 tens? 3 tens and 7 units? 8 tens? 8 tens and 5 units? 9 tens? 4 tens and 7 units? 9 tens and 0? 8 tens and 0? 6 tens and 0? 7 tens and 0?

9. How many figures do you employ to express any number larger than ninety-nine and less than one thousand?

10. How many figures express one hundred and thirteen; and what are they?

11. What number do 3 thousands, 4 hundreds, and 6 units express? What figures express 7 thousand? 9 thousand and 13?

12. What place does the fifth figure from the right occupy? the seventh? eighth?

13. In the number 111, how many apples would the right-hand figure express? the second figure from the right? the left-hand figure? How many would all of them express as they stand?

14. How many units make 1 ten? How many tens make 1 hundred? How many hundreds make 1 thousand? In what ratio do figures increase from the right hand to the left?

MENTAL EXERCISES IN ADDITION.

Questions.

1. John had 1 cent and James gave him 4; how many cents did John then have?

2. George had 5 peaches, and Henry gave him 4; how many peaches did George then have?

3. Susan gave Jane 3 plums, and Sarah gave her 8; how many plums did Jane receive from both of them?

4. Charles Davis purchased a horse for 60 dollars, and sold him for 5 dollars more than he gave; how many dollars did he receive for his horse?

5. John gave 6 cents for a ball and 18 cents for a slate; how many cents did he give for both?

6. Joseph gave 45 cents for an arithmetic and 12 cents for a writing-book; how many cents did they both cost him?

7. Jacob gave 35 dollars for a suit of clothes and 65 dollars for a wagon; how many dollars did he give for both?

8. A merchant bought a hogshead of molasses for 30 dollars, and some tea for 35 dollars; how many dollars did he pay for both?

9. James Kirkham purchased a lot for 11000 dollars, and built a house on it that cost 4672 dollars; what did the lot and house cost him?

10. John Thompson gave 1000 dollars for a store, and 3015 dollars for a stock of goods; what did his store and goods cost him?

11. When of age John was worth 35 dollars, at the age of 25 he had added to this sum 427 dollars; what was he worth at the age of 25?

12. A farmer raised 64 bushels of corn, 103 bushels of wheat, 74 bushels of rye, and 53 bushels of oats; how many bushels of grain did he raise on his farm?

13. A vessel sailed 215 miles the first day, 317 miles the second, and 218 miles the third day; how many miles did it sail in the three days?

Solution.—200 and 300 make 500, and 200 more make 700; then, 15 and 17 make 32, and 18 more make 50, and 700 and 50 make 750 miles *Ans.*

14. How many are 2000 and 3015? 1800 and 72?

15. How many dollars are 64 dollars and 76 dollars?

16. How many peaches are 64 peaches and 81 peaches?

17. How many are 42 and 87? 91 and 86?

18. How many are 47 and 65? 84 and 89?

19. How many are 76 and 44? 68 and 74?

20. How many are 48, 76, and 94? 87 and 16?

21. How many are 68, 44, and 76? 42 and 18?

22. How many are 5000 and 7000? 5 and 7?

23. How many are 8, 6, 7, and 4? 8000, 6000, 7000, 4000? 47 and 76? 84 and 16?

24. How many dollars are 40000 dollars and 30000 dollars? 70000 and 2000?

25. How many are 14000000 and 8000?

26. How many are 16000000000 and 7000000? 86000000000 and 4?

27. How many are 42000000000000 and 72000000000000?

28. How many are 16000000000000000000, 2000000000000, and 1600?

29. How many are 72000000, 160000000, 84000000000, and 87? 96000 and 142000?

MENTAL EXERCISES IN SUBTRACTION.

Questions.

1. John had 7 apples, and gave 2 of them away; how many had he remaining? 2 from 7? 5 and 2?

2. James had 16 cents, and gave Charles 10 of them; how many cents had James remaining? 10 from 16? 6 and 10?

3. A drover started for New York with 16 head of cattle, and on his way 3 of them died; how many had he remaining? 3 from 16? 13 and 3?

4. A vessel started from Liverpool with 214 passengers, but on her way to New York 14 died; how many did she land?

5. 164 men started for Mexico from Philadelphia, and only 16 returned; how many were killed and missing?

6. A man who had 47 dollars lost 8 dollars; how many dollars had he remaining?

7. A boy having 24 oranges sold 7; how many had he remaining?

8. Charles promised to work for a farmer 19 days; how many day's work will remain to be performed after working 11 days?

9. Stephen had 74 cents, and gave 25 cents for a pocket-book; how many cents had he remaining?

10. A baker having 600 loaves of bread sold 450; how many loaves has he remaining?

11. James had 100 dollars, and gave 63 dollars for a watch, a suit of clothes, and a rifle, which he purchased at auction; how many dollars had he remaining?

12. Purchased a farm, two years ago, for 12000 dollars, which I now sell for 14672; how many dollars has the property advanced in value?

13. If you take 69 dollars from 74 dollars, how many remain?

14. A merchant bought goods to the amount of 85 dollars, and sold them for 100 dollars; how many dollars did he gain?

15. A market-man took 174 bushels of potatoes to Philadelphia, and sold 78 bushels; how many bushels remained unsold?

16. October has 31 days; how many days from the 12th of October to the 1st of November?

17. Take 17 dollars from 29 dollars, and how many dollars remain? 17 from 23?

18. A farmer who owned 168 acres of land, sold 73 acres; how many acres had he remaining?

19. Had 3146 dollars, and lost by the failure of a bank 146 dollars; how many dollars had I remaining?

20. From 64 dollars take 32 dollars.

21. From 86 dollars take 14 dollars.

22. From 1000 dollars take 999 dollars.

23. From 100 dollars take 50 dollars.

24. From 75 dollars take 25 dollars.

25. From 80 dollars take 20 dollars.

26. From 60 dollars take 40 dollars.

27. From 75 dollars take 60 dollars.

28. From 86 dollars take 16 dollars.

29. From 14000 dollars take 8000 dollars.

30. From 16000 dollars take 8000 dollars.

31. From 70000 dollars take 60000 dollars.

32. From 160000 take 150000.

33. From 700000 take 500000.

34. From 68000000 take 65000000.

35. From 72000000 take 50000000.

36. From 84000000 take 72000000.

37. Had 215 dollars, and 25 dollars proved to be counterfeit; how much good money had I left?

38. A certain orchard contains 135 apple-trees and 45 cherry-trees; how many more apple-trees does it contain than cherry-trees?

39. Bought a colt for 33 dollars and a carriage for 62 dollars; how many more dollars did the carriage cost than the colt?

40. James was 43 years of age, and he had a son 16 years old; how old was the father when the son was 4 years old?

MULTIPLICATION TABLE.

2times1 are 2	3times1 are 3	4times1 are 4	5times1 are 5
2×*2= 4	3× 2= 6	4× 2= 8	5× 2= 10
2× 3= 6	3× 3= 9	4× 3= 12	5× 3= 15
2× 4= 8	3× 4= 12	4× 4= 16	5× 4= 20
2× 5= 10	3× 5= 15	4× 5= 20	5× 5= 25
2× 6= 12	3× 6= 18	4× 6= 24	5× 6= 30
2× 7= 14	3× 7= 21	4× 7= 28	5× 7= 35
2× 8= 16	3× 8= 24	4× 8= 32	5× 8= 40
2× 9= 18	3× 9= 27	4× 9= 36	5× 9= 45
2×10= 20	3×10= 30	4×10= 40	5×10= 50
2×11= 22	3×11= 33	4×11= 44	5×11= 55
2×12= 24	3×12= 36	4×12= 48	5×12= 60
6× 1= 6	7× 1= 7	8× 1= 8	9× 1= 9
6× 2= 12	7× 2= 14	8× 2= 16	9× 2= 18
6× 3= 18	7× 3= 21	8× 3= 24	9× 3= 27
6× 4= 24	7× 4= 28	8× 4= 32	9× 4= 36
6× 5= 30	7× 5= 35	8× 5= 40	9× 5= 45
6× 6= 36	7× 6= 42	8× 6= 48	9× 6= 54
6× 7= 42	7× 7= 49	8× 7= 56	9× 7= 63
6× 8= 48	7× 8= 56	8× 8= 64	9× 8= 72
6× 9= 54	7× 9= 63	8× 9= 72	9× 9= 81
6×10= 60	7×10= 70	8×10= 80	9×10= 90
6×11= 66	7×11= 77	8×11= 88	9×11= 99
6×12= 72	7×12= 84	8×12= 96	9×12=108
10× 1= 10	11× 1= 11	12× 1= 12	1× 1= 1
10× 2= 20	11× 2= 22	12× 2= 24	2× 2= 4
10× 3= 30	11× 3= 33	12× 3= 36	3× 3= 9
10× 4= 40	11× 4= 44	12× 4= 48	4× 4= 16
10× 5= 50	11× 5= 55	12× 5= 60	5× 5= 25
10× 6= 60	11× 6= 66	12× 6= 72	6× 6= 36
10× 7= 70	11× 7= 77	12× 7= 84	7× 7= 49
10× 8= 80	11× 8= 88	12× 8= 96	8× 8= 64
10× 9= 90	11× 9= 99	12× 9=108	9× 9= 81
10×10=100	11×10=110	12×10=120	10×10=100
10×11=110	11×11=121	12×11=132	11×11=121
10×12=120	11×12=132	12×12=144	12×12=144

* The sign × indicates that the numbers between which it is placed are to be multiplied into each other.

MENTAL EXERCISES IN MULTIPLICATION.

Questions.

1. If you double 1, how many does it make?

2. If you double 2, how many does it make?

3. If you have 3 apples, and John gives you 3, how many apples will you have? 2 times 3 are how many?

4. Joseph had 4 quills, and John had 4 also; how many had both? 4 times 2 are how many?

5. If Joseph has 5 nuts in each hand, how many has he in both hands? 5 times 2 are how many?

6. If you study 6 hours in 1 day, how many hours will you study at the same rate in 3 days?

7. Charles agrees to work for 9 cents a day, and works 9 days; how many cents must he receive for his labor? 9 times 9 are how many?

8. Charles receives 25 cents for every day he studies, and he studies 2 days in a week; how many cents does he receive for studying 1 week? 2 times 25 are how many?

Solution.—2 times 2 tens are 4 tens or 40, and 2 times 5 units are 10 units or 10; then, 40 and 10 added together make 50. *Ans.* 50 *cents.*

9. If he receives 50 cents in 1 week for studying, how many cents will he receive in 5 weeks? 5 times 50 are how many?

10. Purchased 3 yoke of oxen for 50 dollars each; how many dollars will pay for them?

11. Sold 12 sheep for 4 dollars a head; how many dollars must I receive for them?

12. Seven boys had 9 marbles apiece; how many had all of them?

13. Employed 100 men for 1 month, and gave them 12 dollars each; how many dollars did I give all of them?

14. A certain wagon, having 4 wheels, has 16 spokes in each wheel; how many spokes do all the wheels contain? 4 times 16 are how many? 4 times 17? 4 times 18?

15. A man bought 20 stoves at 10 dollars apiece; how many dollars did they come to?

16. Eleven boys had, each, 11 marbles; how many had all of them?

17. If a bushel of apples cost 5 shillings, how many shillings must I pay for 6 bushels? for 7 bushels? for 8 bushels?

18. If 1 man will do a piece of work in 11 days, how many such pieces will 2 men do in 22 days?

19. If 1 box of raisins cost 8 dollars, how many dollars will 3 boxes cost? 4 boxes? 5 boxes? 6 boxes?

20. If the price of flour is 7 dollars per barrel, how many dollars will 2 barrels cost? 3 barrels? 4 barrels? 5 barrels?

21. Bought corn for 7 shillings per bushel; how many shillings must I give for 8 bushels? 9 bushels? 10 bushels? 6 bushels? 4 bushels? 3 bushels?

22. Two brothers, together, received 17 dollars per month for laboring in a coal-mine; how much did they receive for laboring 3 months?

Solution.—3 times 1 ten are 30, and 3 times 7 units are 21; then, 30 and 21 are 51. *Ans.* 51 *dollars.*

23. There are 13 windows in a certain house, and each window contains 8 panes of glass; how many panes of glass do all the windows contain?

24. A farmer planted 7 rows of potatoes, and 17 hills in each row; how many hills did he plant?

25. A gentleman, residing in the country, makes it a practice to ride 18 miles every morning (Sundays excepted); how many miles will he ride in 6 mornings? in 7? in 8?

26. If Henry solves 18 problems in algebra in 1 day, how many will he solve in 4 days? in 5 days? in 6 days? in 7 days? in 8 days?

27. If 3 men cut 4 cords of wood in 1 day, how many cords will they cut in 8 days?

28. If 6 men mow over 3 acres of ground in 1 day, how many acres will they mow over, at that rate, in 6 days?

29. If 17 men dig in the gold mines of California, ore

to the value of 500 dollars per day, what would be the value of the ore, at the same rate, which they would dig in 6 days?

Solution.—6 times 500 are 3000.

Ans. 3000 *dollars.*

30. 2 times 9 dollars are how many?
31. 2 times 90 dollars are how many?
32. 2 times 900 dollars are how many?
33. 2 times 9000 dollars are how many?
34. 2 times 90000 are how many?
35. 2 times 900000 are how many?
36. 3 times 7 are how many?
37. 3 times 70 are how many?
38. 3 times 700 are how many?
39. 3 times 7000 are how many?
40. 3 times 70000 are how many?
41. 3 times 700000000 are how many?
42. 4 times 6 are how many?
43. 4 times 60 are how many?
44. 4 times 600 are how many?
45. 4 times 6000 are how many?
46. 4 times 600000 are how many?

MENTAL EXERCISES IN DIVISION.

Questions.

1. John and James went to catch some fish, and James put 2 apples in his pocket, but John did not take any with him. After fishing for some time, James took his apples out of his pocket, and divided them equally with John; how many apples had each? 2 in 2 how many times?

2. If 3 apples are divided equally among 2 boys, how many apples will each one have?

Solution.—2 is contained in 3 one time and one-half time. *Ans.* $1\frac{1}{2}$ (one and a half).—2 in 4? 2 in 5?

Ans. $2\frac{1}{2}$ times.

3. If 3 apples are divided equally among 3 boys, how many apples will each boy receive? *Ans.* 1 *apple.*

4. If 4 apples are divided among 3 boys equally, how many apples will each one receive?

5. There will be one whole apple apiece, and then the other apple will have to be divided into three equal parts, and each boy receive one of these parts, and one of these parts will be called a third. Then each boy will receive 1 apple and 1 third of an apple.

Ans. $1\frac{1}{3}$ (one and one-third).

6. If 5 apples be divided equally among 3 boys, how many apples will each boy receive?

Solution.—3 is contained in 5 1 time and 2 over. In 1 apple there are 3 thirds, and consequently in 2 apples there are 6 thirds; then 6 thirds divided equally among 3 boys will be just 2 thirds apiece.

Ans. $1\frac{2}{3}$ (one and two-thirds).

7. If 6 apples be divided equally among 3 boys, how many apples will each boy receive?

Solution.—3 in 6, 2 times. *Ans.* 2 *apples.*

8. When a thing is divided into two equal parts, what is one of its parts called? *Ans.* $\frac{1}{2}$ (one-half).

9. Divide 1 by 2. *Ans.* $\frac{1}{2}$.

10. Divide 1 by 3. *Ans.* $\frac{1}{3}$ (one-third).

11. Divide 1 by 4. *Ans.* $\frac{1}{4}$ (one-fourth).

12. Divide 1 by 5. *Ans.* $\frac{1}{5}$ (one-fifth).

13. Divide 1 by 6. *Ans.* $\frac{1}{6}$ (one-sixth).

14. Divide 1 by 7; by 18; by 19; by 16.

15. Divide 1 by 8; by 15; by 14; by 21.

16. Divide 1 by 9; by 11; by 12; by 14.

17. Divide 1 by 10; by 12.

Ans. to last $\frac{1}{12}$ (one-twelfth).

18. Divide 2 by 3. *Ans.* $\frac{2}{3}$ (two-thirds).

19. What is the fifth of 4?

Solution.—The fifth of 1 is $\frac{1}{5}$ (one-fifth), and the fifth of 4 is $\frac{4}{5}$ (four-fifths).

20. What is the seventh of 3? *Ans.* $\frac{3}{7}$ (three-sevenths).—The seventh of 5? of 6?

21. How many halves in a whole thing?

Ans. 2 *halves.*

22. How many thirds? *Ans.* 3 *thirds.*

23. How many fourths in 1 orange?

24. How many fifths in 1 peach?

25. How many sixths in 1 lemon?

26. What is the half of 7? *Ans.* $\frac{7}{2}$, or $3\frac{1}{2}$ (seven halves, or three and a half whole ones).

27. Charles has 12 nuts, which he wishes to divide equally among 3 boys; how many nuts must he give each boy? 3 in 12, how many times?

Solution.—3 is contained in 12 4 times. *Ans.* 4 nuts. Proof, 4 times 3 are 12.

28. A father has 8 oranges, which he wishes to divide equally between his 2 sons, James and Henry; how many must he give each one of them? 2 in 8 how many times? 2 times 4 are how many? 2 in 10? 2 in 12? 2 in 14? 2 in 16? 2 in 18? 2 in 20?

29. A father having an estate of 24000 dollars, wishes to divide it equally among his 8 children; how many dollars must he give each child?

30. A man having 1400 sheep wishes to divide them so as to put an equal number into each field; how many must he put into each field, if he has but 2 fields? if he has 7 fields?

31. James divided 144 oranges equally among 12 boys; how many did he give each boy?

32. Eliza divided 16 plums equally among 4 girls; how many plums did she give each girl?

33. William has 50 cents, and gives 5 cents a pound for raisins; how many pounds of raisins can he buy with his money?

34. Paid 36 dollars for 6 cords of wood; what is that per cord?

35. Paid 144 dollars for 12 tons of hay; what did I pay per ton?

36. Bought 8 pounds of tea for 64 shillings; how many shillings per pound did I give for it?

37. How many 10-acre lots are there in 200 acres? in 300? in 400?

38. How many bags will it require to contain 60 bushels of oats, if each bag contains 3 bushels?

39. George translated 180 lines in Virgil in 3 days; how many lines did he translate on an average per day?

40. Charles receives 96 dollars for laboring 12 months; how many dollars is that per month?

41. A merchant sold 3 yards of cloth for 24 dollars; how much is that per yard?

42. How much is $\frac{2}{2}$ (2 halves)? *Ans.* 1.

43. How much is $\frac{3}{2}$ (3 halves)? *Ans.* $1\frac{1}{2}$—because 2 is contained in 3 one and one-half time.

44. How much is $\frac{4}{2}$?

Solution.—2 in 4 2 times. *Ans.* 2.—$\frac{5}{2}$? *Ans.* $2\frac{1}{2}$.—$\frac{6}{2}$? *Ans.* 3.—$\frac{7}{2}$? *Ans.* $3\frac{1}{2}$.

45. Divide 3 by 3. *Ans.* $\frac{3}{3}$=*1.

46. Divide 4 by 3. *Ans.* $\frac{4}{3}=1\frac{1}{3}$.

47. Divide 5 by 3. *Ans.* $\frac{5}{3}=1\frac{2}{3}$.

48. What is the $\frac{1}{2}$ of 6? *Ans.* $\frac{6}{2}=3$.

49. Divide 17 dollars equally among 4 men.

Solution.—4 is contained in 17 4 times and $\frac{1}{4}$ of a time. *Ans.* $4\frac{1}{4}$ (four dollars and one-fourth of a dollar).

50. Divide 16 dollars equally among 3 men.

Ans. $5\frac{1}{3}$ *dollars.*

51. Divide 17 dollars equally among 5 men.

Solution.—5 in 17 3 times and $\frac{2}{5}$ of a time.

Ans. $3\frac{2}{5}$ *dollars.*

52. Divide 25 dollars equally among 6 men. *Ans.* $4\frac{1}{6}$ *dollars.*—Among 7 men. *Ans.* $3\frac{4}{7}$ *dollars.*—Among 8 men. *Ans.* $3\frac{1}{8}$ *dollars.*

53. Divide 36 dollars equally among 7 men.

54. Divide 85 dollars equally among 12 men.

55. Divide 97 dollars among 8 men, so that each man will receive an equal portion.

56. How much is $\frac{7}{4}$ of a quart?

Ans. $1\frac{3}{4}$ (one quart and three-fourths of a quart).

57. How much is $\frac{3}{4}$ of a quart? $\frac{9}{4}$? $\frac{10}{4}$? $\frac{11}{4}$?

58. How much is $\frac{8}{9}$ of an acre? $\frac{9}{9}$? $\frac{10}{9}$?

59. Divide 18 into 7 equal parts. *Ans.* $2\frac{4}{7}$.

---

* The sign = is read equals.

ADDITION.

27. What is Addition?

A. It is the putting of two or more numbers together into one sum or total; as 2 and 1 are 3, 6 and 4 are 10.

SIMPLE ADDITION.

28. What is Simple Addition?

A. It is the putting of numbers together of the same name or denomination; as 3 dollars and 4 dollars are 7 dollars, 4 pounds and 2 pounds are 6 pounds.

RULE.

29. How do you place the numbers to be added?

A. Under each other, so that units may stand under units, tens under tens, &c.

30. How then do you proceed?

A. Draw a line under them, and add the figures of the first or right-hand column together, and if they do not come to more than 9, set down their amount directly under the column added, and proceed to the next column.

31. But what do you do if the figures of a column amount to more than 9?

A. Carry 1, for every 10, to the next column, and set down the remainder; or set down the right-hand figure under the column added, and carry the left-hand figure to the next column.

32. What is meant by carrying?

A. Adding to the next column.

33. When you have any number between 9 and 20, how many have you to carry?

A. 1; as 10, 11, 12, 13, 14, 15, 16, 17, 18, 19.

34. When you have any number over 19, and under 30, how many have you to carry?

A. 2; because there would be 2 tens, or 2 would be the left-hand figure.

35. What do you set down when you add the last column?

A. The whole amount.

PROOF.

36. How do you prove the work?

A. Reckon the figures downwards, in the same manner as they were reckoned upwards; and if it be right the last amount will be equal to the first.

EXAMPLES.

(1.)	(2.)	(3.)	(4.)	(5.)	(6.)	(7.)
2	2	4	4	7	4	8
1	2	3	7	8	12	14
3		7		15		22

(8.)

24 4 (units) and 4 (units) are 8 (units).
24 2 (tens) and 2 (tens) are 4 (tens).
Ans. 48 4 tens and 8 units equal 48 units.

REMARK.—For the sake of brevity, we shall hereafter, *as a general thing*, omit to distinguish between units, tens, and so forth, in our operations, and leave this for the pupil to do; but at the same time we wish *him* to observe that figures increase in tenfold *ratio* from right to left.

(9.)	(10.)
34	36
34	36
	72

6 and 6 are 12. The right-hand figure (2) is to be set down, under the first column, and the left-hand figure (1) is to be carried to the next column: 1 and 3 make 4; then 4 and 3 make 7.

(11.)	(12.)	(13.)	(14.)
48	97	1216	3676
38	63	3647	1284
	160		4960

REMARK.—When the answer is not given the pupil is required to prove the operation.

(15.)	(16.)	(17.)	(18.)
3687	8463	4863	76243784
2364	7432	7432	23462876
8634	2618	4960	48637821
7681	3786	8167	78427649
22366		25422	
22366 Proof.		25422	

19. What will 4 pounds of sugar come to, at 10 cents a pound? *Ans.* 40 *cents.*

20. What will 3 pounds of tobacco come to, at 18 cents a pound? *Ans.* 54 *cents.*

21. What will 2 pounds of codfish come to, at 7 cents a pound? *Ans.* 14 *cents.*

22 What will 8 pounds of tea come to, at 50 cents a pound? *Ans.* 400 *cents,* or 4 *dollars.*

23. What will 6 yards of cloth come to, at 500 cents, or 5 dollars, a yard? *Ans.* 3000 *cents,* or 30 *dollars.*

24. What will 1 pound of sugar, at 10 cents a pound, and 2 pounds of tobacco, at 18 cents a pound, come to? *Ans.* 46 *cents.*

25. John is 6 years old, James 7, and his father 30; what is the sum of all their ages? *Ans.* 43 *years.*

26. You may now add together the following numbers: 1, 21, 321, 4321, 54321, 654321, 7654321, 87654321, 987654321.

REMARK.—When you write numbers, begin at the right hand, and observe to keep the right-hand column even; thus,

1 One.
21 Twenty-one.
321*
4,321†
54,321‡
654,321
7,654,321
87,654,321
987,654,321
Ans. 1,083,676,269

* See Q. 9. † See Q. 10. ‡ See Q. 11.

27. Write down the following numbers in order, and add them: seventy-six, eight hundred and sixteen, one thousand eight hundred and fourteen, three thousand million and four. *Ans.* 3000002710.

37. What is the sign of addition, and what does it indicate?

A. + (Plus), and it indicates that the numbers between which it is placed are to be added together; thus, 2+3 expresses the sum of 2 and 3, or that 2 and 3 are to be added together.

38. What is the sign of equality?

A. = (Two equal and parallel lines, placed horizontally); thus, 2+3=5, means that the sum of 2 and 3 is equal to 5.

EXAMPLES.

1. 8+*3=†11, *Ans.* 2. 3+9=
3. 18+6+7=31, *Ans.*
4. 3637+7643+8647+3841=23768, *Ans.*
5. 86+7321867321863=7321867321949, *Ans.*
6. 376+54638+2347864+783=
7. 976348+1763478+21=2739847, *Ans.*
8. 86472+38462+4638=
9. 44632+81+36+48+3781073843=3781118640, *Ans.*
10. 6473863456+78632864+3786458=
11. 73+213+1000+24003+63+48+6843=32243.
12. 84327+46387+24386+7842

SUBTRACTION.

39. What is Subtraction?

A. It is the taking of a less number from a greater, whereby to show the difference or excess.

* See Q. 37. † See Q. 38.

40. What are the numbers called?

A. The *greater*, the Minuend, and the *less*, the Subtrahend.

41. What is the third number, or the number resulting from the operation, called?

A. The Difference or Remainder.

SIMPLE SUBTRACTION.

42. What is Simple Subtraction?

A. When the Minuend and Subtrahend are of the same denomination.

RULE.

43. How do you write numbers to subtract one from another?

A. The less under the greater, or the subtrahend under the minuend, and units under units, tens under tens, and so on.

44. How then do you proceed?

A. Begin at the right, or the place of units, and take each figure in the subtrahend from its corresponding figure in the minuend, or the figure above; and write the difference under those figures, in the same order or place.

45. If a figure in the subtrahend be greater than its corresponding figure, or the figure above in the minuend, what do you do?

A. Add 10 to the figure above in the minuend, and then take the figure in the subtrahend from the sum, or the figure in the minuend so increased; and set down the remainder as before, and carry 1 to the next left-hand figure of the subtrahend.

PROOF.

46. How do you prove the work?

A. Add the difference or remainder to the subtrahend, and if the work is right, the sum will be equal to the minuend.

EXAMPLES.

	(1.)	(2.)	(3.)	(4.)	(5.)
From	3 Minuend.	4	14	18	19
Take	2 Subtrahend.	2	8	8	6
Leaves	1 Difference.	2	6	10	

(6.)	(7.)	(8.)
734	864	3478
612*	743	2569†
122		909

Take 9 from 8 we cannot; therefore we add 10 to the figure 8 above, which makes 18. We then say 9 from 18 leaves 9; then 1 to carry to the next figure in the subtrahend (6) makes 7, and 7 from 7 leaves 0, and 5 from 14 leaves 9, and 3 from 3 leaves 0.

47. REMARK.—A 0 (cipher or nought) when at the left does not count any thing, neither does it supply any vacant place, and therefore is not set down, as in the last example.

	(9.)	(10.)	(11.)
From	846321	647321	684732
Take	736843	543896	397481
Diff.	109478		287251

	(12.)	(13.)	(14.)
From	863712	762348	6378642
Take	416	234769	1374683
Diff.	863296		5003959
Proof	863712‡		6378642

15. A man borrows 136 dollars, and pays 36 back; how much must he afterwards pay to liquidate the debt?

Ans. 100 *dollars.*

16. A man purchased a horse for 300 dollars, and paid 200 dollars down; how much had he to pay afterwards?

Ans. 100 *dollars.*

* See Q. 44. † See Q. 45. ‡ See Q. 46.

17. Take 300 dollars from 400 dollars.

Ans. 100 *dollars.*

18. A person having 8000 dollars gave away 72 dollars; how much had he left? *Ans.* 7928 *dollars.*

19. The greater of two numbers is 76, and the less 42; what is their difference? *Ans.* 34.

20. What number together with these two, viz. 743 and 642, will make 1546? *Ans.* 161.

48. What is the sign of subtraction; and what does it indicate?

A. — (Minus); and it indicates that the number before which it is placed is to be subtracted from the number which precedes it. Thus, 4—2 expresses the difference of 4 and 2, or that 2 is to be taken from 4.

EXAMPLES.

1. 367*—28†=339 *Ans.* 2. 8654—738=
3. 47632—8647=38985, *Ans.*
4. 7386—237=7149, *Ans.*
5. 36874863787**32**—47=3687486378685, *Ans.*
6. 446378647—36786=446341861, *Ans.*
7. 4738649587—3864=4738645723, *Ans.*

MULTIPLICATION.‡

49. What is Multiplication?

A. It is taking the Multiplicand, or the number to be multiplied, as often as there are units, in the Multiplier, or the number by which you multiply.

Remark.—This definition of multiplication is strictly correct; still it may be well to observe that when your multiplier is less

* See Q. 46. † See Q. 43.

‡ When a particular number is to be repeated more times than one, multiplication is a short way of performing the operation; but the same result may be obtained by addition: hence multiplication is evidently a contraction of addition.

than a unit, such as ½, ¼, &c., as your multiplier is but one-half of a unit, or one-fourth of a unit, &c., the multiplicand must not be taken entire, but only one-half, or one-fourth of it, &c.; for instance, to multiply by ½, you take half the multiplicand, to multiply by ¼, you take one-fourth of the multiplicand, &c.

50. What then is the number to be multiplied called?

A. The Multiplicand.

51. What is the number by which you multiply called?

A. The Multiplier.

52. What is the result of the operation, or the number obtained by multiplying two or more numbers together called?

A. The Product.

53. What are the multiplicand and multiplier frequently called?

A. Factors of the product.

SIMPLE MULTIPLICATION.

54. What is Simple Multiplication?

A. When the multiplicand and multiplier are respectively of but one denomination.

RULE.

55. How do you proceed to multiply, when the multiplier does not exceed 12?

A. Begin at the right of the multiplicand, and multiply each of its figures by the multiplier, observing to set down and carry as in addition.

REMARK.—There are two or three different ways of setting the multiplier. It may be set at the right, under the multiplicand, or it may be set at the right of it, with the sign × placed between it and the multiplicand; or the sign ⌊, which is more convenient, may be substituted for the sign of multiplication, and the multiplier set at the right. The pupil is at liberty to adopt either method, though he is advised to choose the latter for sake of convenience, which he will discover after progressing further.

EXAMPLES.

1. Multiply 384 by 2.

Multiplicand 384 / 2 Multiplier.
Product 768

2 times 4 are 8. The 8 is set down below under the 4. Then we say 2 times 8 are 16; we set down the 6 and carry the left-hand figure (1) to the product of the multiplier into the next figure. We say 2 times 3 are 6, and 1 to carry makes 7, which we set down.

2. Multiply 463 by 3. 463*/3†

3. Multiply 786 by 4. 786 / 4 Product, 3144 or 786 × 4 = 3144

4. Multiply 864 by 5. 864 / 5 5. 384 / 6 = 2304

6. 3842 / 7
7. 8432 / 8 = 67456 *Prod.*
8. 7642 / 9 =
9. 4768 × 10 = 47680 *Prod.*
10. 7864 × 11 =
11. 34786 × 12 = 417432 *Prod.*

56. How do you proceed to multiply when the multiplier exceeds 12?

A. Multiply each figure of the multiplicand by each figure of the multiplier separately.

57. Where do you place the first figure of each respective product?

A. In the same place under the multiplicand as the figure by which you multiply occupies in the multiplier.

58. How do you ascertain the total product?

A. Add together the several partial products as they stand.

---

* See Q. 50. † See Q. 51.

EXAMPLES.

1. Multiply 647 by 264.

OPERATION.

647 / 264*

1294†
3882
2588

170808‡

In this example we commence to multiply with the figure 2, occupying the place of hundreds in the multiplier, and set the first figure of its product under the figure 6, occupying the place of hundreds in the multiplicand. We say 2 times 7 are 14; the right-hand figure 4 we set down, and carry the left-hand figure 1. Then we say 2 times 4 are 8, and 1 to carry makes 9, which we set down; then 2 times 6 are 12. Then we multiply by the figure 6, occupying the place of tens, in a like manner, and set the first figure of its product under the figure 4 in the multiplicand, occupying the place of tens. We then proceed with the figure 4 in the place of units, and place the first figure of its product under the figure 7, occupying the place of units in the multiplicand. We then add these several *partial* products together as they stand, which gives the total product.

REMARK.—It will be found more convenient sometimes to commence to multiply with a figure of the multiplier standing in the place of units or tens, or some other place. It is immaterial with which of them you begin to multiply, the result in either case will be the same.

The last example performed different ways.

647 / 264	647 / 264	647	Common
3882	2588	264	method of
1294	3882	2588	setting the
2588	1294	3882	multiplier,
170808	170808	1294	though we
		170808	do not consider it the best.

2. Multiply 789 by 53. Product 41817.

* See Q. 56. † See Q. 57. ‡ See Q. 58.

3. Multiply 463 by 28.
4. Multiply 365 by 79. Product 28835.
5. Multiply 947 by 378.
6. Multiply 7634 by 475. " 3626150.
7. Multiply 923 by 894.
8. Multiply 40674 by 347. " 14113878.
9. Multiply 7863 by 684.
10. Multiply 473 by 85. " 40205.
11. Multiply 46387 by 2386. " 110679382.
12. Multiply 64784 by 3876.

DIVISION.

59. What is Division?

A. It is a method of ascertaining how many times one number is contained in another, and also what remains.

60. What is the number to be divided called?

A. The Dividend.

61. What is the number called by which you divide?

A. The Divisor.

62. What is the number resulting from the division of one number by another called?

A. The Quotient.

63. What is the number remaining after the operation is performed (if any) less than, and what is it called?

A. It is less than the divisor, and is called the Remainder.

REMARK.—Division is a short method of performing many subtractions.

SIMPLE DIVISION.

64. When is division termed Simple?

A. When the dividend is a simple number, or consists of but one denomination.

RULE.

65. When the divisor does not exceed 12, how do you proceed to divide, after setting the divisor at the left of the dividend?

A. Find how often the divisor is contained in a sufficient number of the left-hand figures of the dividend to contain it once or more, under which write the result, for the first or left-hand figure of the quotient.

66. When there is a remainder, what do you do before dividing the next figure of the dividend?

A. Prefix this remainder to it.

REMARK.—Continue the operation in this manner till all the figures of the multiplicand are divided.

PROOF.

67. How do you prove the operation, and what must the result equal?

A. Multiply the quotient by the divisor, and add the remainder (if any) to the product, and this result will equal the dividend.

EXAMPLES.

1. Divide 768 by 2.

OPERATION.

*2)768†
*384

After writing the divisor (2) at the left hand of the dividend (768), we say 2 in 7, 3 times and 1 over. This 1 prefixed to 6 makes 16; then we say 2 in 16, 8 times, and 2 in the next figure (8) of the dividend 4 times.

2. Divide 346786 by 2. Quotient 173393.
3. Divide 24678384 by 3. " 8226128.
4. Divide 46887648 by 4. " 11596912.
5. Divide 3684763 by 5. " 736952+3 R.
6. Divide 648374 by 6.
7. Divide 786438 by 9.

REMARK.—The process of dividing when the divisor does not exceed 12 is called Short Division.

* See Q. 65. † See Q. 66.

8. Divide 64737 by 8.

OPERATION.

8)64737
8092+1
8*
Proof 64737

The remainder (1) is added to the product of the divisor and quotient.

9. Divide 764837 by 9, and prove the operation.
10. Divide 678497 by 10, " "
11. Divide 463784 by 11, " "
12. Divide 678497 by 12, " "

68. REMARK.—The sign ÷ indicates division, and placed between two numbers shows that the former is to be divided by the latter. Thus,

13. 8÷†4=2, and 6÷3=2, and 12÷4=3.
14. 486÷†2=243 quotient.
15. 67846÷7= 16. 826÷3=
17. 84634÷8=10579+2.
18. 234÷6=39 quotient. 19. 74634÷9=

69. Another form of expressing division is to write the dividend over a line and the divisor under it. Thus, $\frac{4}{2}$ indicates that 4 is divided by 2, and it equals 2, the quotient of 4 divided by 2.

20. What is the quotient of $\frac{8}{2}$? 2 in 8, 4 times. *Ans.* 4.
21. $\frac{16}{2}$‡=what number? *Ans.* 8.
22. $\frac{24}{4}$=what?—23. $\frac{36}{9}$=4 *Ans.*—$\frac{9}{3}$=how many?
24. $\frac{96}{8}$=12. 25. $\frac{17}{2}$=8$\frac{1}{2}$ *Ans.*
26. $\frac{28}{9}$=3$\frac{1}{9}$ *Ans.* 27. $\frac{37}{9}$=what?
28. $\frac{67}{8}$=8$\frac{3}{7}$. 29. $\frac{67}{8}$=

RULE.

70. How do you proceed to divide when the divisor exceeds 12?

A. As in Short Division, with the exception of writing out the entire computation.

REMARK.—This method is called Long Division.

---

* See Q. 67. † See No. 68, Rem. ‡ See No. 69.

71. After writing the divisor at the left of the dividend, as in short division, what three successive steps do you take?

A. Count off a sufficient number of figures on the left of the dividend to contain the divisor one or more times. Ascertain by trial how many times the divisor is contained in these figures, and set the number at the right of the dividend as the first figure of the quotient.

72. What then do you multiply the divisor by, and where do you set the product?

A. By this quotient figure, and set the product under the figures on the left of the dividend, which contain the divisor the number of times expressed by the quotient figure.

73. From what do you subtract this product, and what do you call the difference?

A. From the figures above, and call the difference the first remainder.

74. What do you bring down to this remainder, and how then do you divide?

A. The next figure of the dividend, and divide as before.

REMARK 1.—Proceed in this manner till all the figures of the dividend are brought down and divided.

R. 2.—The method of proof is the same as in short division.

R. 3.—The product of the divisor, by a quotient figure, must always be equal to, or less, than the part of the dividend from which it is to be subtracted, and the remainder less than the divisor.

R. 4.—When, after bringing down the next figure in the dividend to any remainder, the divisor is not contained in the number, write a cipher for the next figure of the quotient, and bring down another figure of the dividend.

EXAMPLES.

1. Divide 10 by 2.

OPERATION.

2)10(5 quotient. (2 in 10, 5 times.)
10
0 remainder.

2. Divide 167 by 3.

†3)16*7§(5*5
15†
‡17§
15
2 rem.

3 is contained in the two figures (16) on the left of the dividend 5 times; 5 times 3 are 15. This product (15) subtracted from the figures (16) above leaves 1. To this remainder we bring down the next figure of the dividend, which is 7, and then we ascertain how many times the divisor (3) is contained in 17, which is 5 times; we set this number (5) in the quotient, at the right of the other quotient figure; then we multiply the divisor by it, and subtract its product (15) from the figures (17) above, which leaves a remainder (2). The remainder (2) may now be set at the right of the quotient (55), and the divisor (3) placed under it, with a line between (thus, $55\frac{2}{3}$ quotient), which will express the entire quotient of 167 divided by 3.

3. Divide 8764 by 6.

†6)8*7§6§4§(1460$\frac{4}{6}$ quotient.
6†
‡27§
24
36§
36
04§

4. Divide 7867 by 6 (by long division). Quot. $1311\frac{1}{6}$.
5. Divide 4638 by 7. " " " $662\frac{4}{7}$.
6. Divide 7843 by 8, and prove the operation.
7. Divide 4632 by 9, " " " $514\frac{6}{9}$.
8. Divide 7384 by 11, " " "
9. Divide 4638 by 12, " " " $386\frac{6}{12}$.
10. Divide 146 by 13.

13)146*($11\frac{3}{13}$
13
16
13
3

The divisor (13) is contained in the figures (14) on the left of the dividend 1 time, and 1 remainder. To this remainder the next figure (6) of the divi-

* See Q. 71. † See Q. 72. ‡ See Q. 73. § See Q. 74.

dend is brought down. Then we say 13 in 16, 1 time, and 13 from 16 leaves 3.

11. Divide 1467 by 13. Quotient $112\frac{11}{13}$.

12. Divide 1828 by 14.
13. Divide 1636 by 15.
14. Divide 1344 by 16.
15. Divide 463 by 18.
16. Divide 763 by 19.
17. Divide 874 by 17.

The quotients of these examples are not given: their proof is required, after the manner of proving operations in short division; after which they are to be shown to the teacher for inspection.

18. Divide 256 by 21.

$$21)256*(12\tfrac{4}{21}$$
$$\begin{array}{r} 21 \\ \hline 46 \\ 42 \\ \hline 4 \end{array}$$

The divisor (21) is contained in 25, 1 time and 4 remainder, and in 46, 2 times and 4 remainder.

19. Divide 367 by 23. Quotient $15\frac{22}{23}$.
20. Divide 468 by 24.
21. Divide 674 by 36. Quotient $18\frac{26}{36}$.
22. Divide 847 by 42.

$$42\dagger)847*(20*\tfrac{7}{42}$$
$$\begin{array}{r} 84\dagger \\ \hline 07 \end{array}$$

The divisor (42) is contained in 84, 2 times, and in 7, 0 times, and 7 remainder.

23. Divide 817 by 9. Quotient $90\frac{7}{9}$.
24. Divide 864 by 43.
25. Divide 1642 by 16. Quotient $102\frac{10}{16}$.
26. Divide 4678 by 422.

$$422\dagger)4678*(11*\tfrac{36}{422}$$
$$\begin{array}{r} 422\dagger \\ \hline 458 \\ 422 \\ \hline 36 \end{array}$$

The divisor (422) is contained in 467, 1 time and 45 remainder, and in 458, 1 time and 36 remainder.

27. Divide 6784 by 527.
28. Divide 6784 by 627. Quotient $10\frac{514}{627}$.
29. Divide 7862 by 324.

---

* See Q. 71. † See Q. 72.

30. Divide 786473 by 7673.

7673)786473*(102*$\frac{3827}{7673}$
7673
19173*
15346
3827

31. Divide 786423 by 7672.
32. Divide 486378 by 6472. Quotient $75\frac{978}{6472}$.
33. Divide 864275 by 3846.
34. Divide 274638 by 47.
35. Divide 678012 by 8634.
36. Divide 463876 by 786.
37. Divide 103026 by 103.

103)10302*6*(10*0*0*$\frac{26}{103}$
103
002*6*

38. Divide 1020047 by 102.
39. Divide 2136478 by 6214.
40. Divide 3784673 by 2463.

NOTES IN MULTIPLICATION AND DIVISION.

NOTE I.

75. When the multiplier is 1, with a cipher or ciphers annexed, how do you multiply?

A. By simply annexing the number of ciphers to the multiplicand.

EXAMPLES.

1. Multiply 348 by 10. By annexing the cipher we have for the product 3480.
2. Multiply 348 by 100.† Product 34800.
3. Multiply 684 by 1000.† " 684000.
4. Multiply 7 by 10000. " 70000.

---

*See R. 4, p. 42. † See Q. 75.

NOTE II.

76. When the divisor is 1, with a cipher or ciphers annexed, how do you divide?

A. By cutting off as many figures from the right of the dividend as there are ciphers in the divisor.

REMARK.—The figures at the left will be the quotient, and those at the right the remainder.

EXAMPLES.

1. Divide 3480 by 10. By cutting off the cipher from the right of the dividend we have 348 for the quotient.
2. Divide 684000 by 1000. Quotient 684.
3. Divide 78643 by 1000.
   1|000*)78|643* = 78†$\frac{643}{1000}$† quotient.
4. Divide 64734 by 10000.
5. Divide 86473 by 100. Quotient 864$\frac{73}{100}$.
6. Divide 486723 by 100000.
7. Divide 678274 by 10. " 67827$\frac{4}{10}$.

NOTE III.

77. When there are ciphers either at the right of the multiplier or multiplicand, or at the right both of the multiplier and the multiplicand, how do you multiply?

A. By annexing them to the product of the figures at the left of them.

EXAMPLES.

1. Multiply 4678 by 3400.

4678	3400‡	or	4678
			3400
14034			1871200
18712			14034
Product	15905200‡	Product	15905200

---

* See Q. 76. † See Remark, p. 46. ‡ See Q. 77.

2. Multiply 7864 by 674000.
3. Multiply 9843 by 27000. Product 265761000.
4. Multiply 64300 by 6700.

64300* / 6700*

3858
4501

430810000*

5. Multiply 78400 by 6400.
6. Multiply 46000 by 7300. Product 335800000.

REMARK.—When the multiplier contains a cipher or ciphers not occupying places at the right, omit them in the operation.

7. Multiply 23467 by 20008.

23467 / 20008†

46934
187736

469527736

8. Multiply 7864 by 304.
9. Multiply 8423 by 607.

NOTE IV.

78. When there are ciphers at the right of the divisor, how do you proceed to divide?

A. Cut them off, and also the same number of figures from the right of the dividend; then divide the figures remaining at the left in the dividend by those remaining at the left in the divisor, and to the final remainder annex the figures cut off from the right of the dividend.

EXAMPLES.

1. Divide 364783 by 300.

3|‡00)3647|83‡

$1215\frac{283}{300}$

2. Divide 364783 by 20. Quotient $18239\frac{3}{20}$.

* See Q. 77. † See Rem., page 47. ‡ See Q. 78.

3. Divide 76487 by 400.
4. Divide 6473 by 500.
5. Divide 463873 by 3800.

38|00*)4638|73*(122$\frac{273}{3800}$
38
83
76
78
76
273

6. Divide 63847 by 730. Quotient 87$\frac{457}{730}$.
7. Divide 46278 by 7800.
8. Divide 63847 by 1630. " 39$\frac{277}{1630}$.

79. When two or more numbers multiplied together will form a number, what is it called?

A. A *composite* number.

REMARK.—Numbers are divided into two classes, prime and composite. When a number cannot be formed by the multiplication of two or more numbers together, it is called a *prime* number; as 1, 2, 3, 5, 7, 11, 13, 17, 19, 23, &c.

NOTE V.

80. How do you proceed to multiply by a composite number?

A. Multiply the multiplicand by one of its factors, and this product by the other.

REMARK.—When the composite number is resolved into *three or more* factors, multiply the product of each factor successively by a remaining factor till they are all taken up, and the last product will be the answer or total product.

EXAMPLES.

1. Multiply 684 by 24. (4† × 6‡ = 24)

684† / 6†
4104‡ / 4‡
Product 16416

We first multiply the multiplicand (684) by the factor 6, and this product (4104) by 4, the other factor of 24.

* See Q. 78. † See Q. 80. ‡ Ibid.

2. Multiply 7437 by 36. $(6\times6=36)$
3. Multiply 8473 by 27. (3×9)
4. Multiply 368 by 42.
5. Multiply 784 by 28. Product 21952.
6. Multiply 136 by 96.
7. Multiply 68 by 49. Product 3332.
8. Multiply 284 by 56.
9. Multiply 163 by 72. Product 11736.
10. Multiply 238 by 25.
11. Multiply 39 by 45. Product 1755.
12. Multiply 386 by 63.

NOTE VI.

81. How do you proceed to divide by a *composite* number?

A. Divide the dividend by one of its factors, and this quotient by the other.

82. Which will be the required quotient; and how do you obtain the total remainder?

A. The last quotient will be the one required; and to obtain the total remainder, multiply the last remainder by the first divisor, and add the first remainder to the product.

EXAMPLES.

1. Divide 6478 by 28 $(4\times7=28)$

*7)6478
†4)925+3
‡231+1×7=7+3=10 Rem.‡
Quotient $231\frac{10}{28}$.

The last remainder (1) is multiplied by the first divisor (7), and the first remainder (3) added to the product.

2. Divide 63784 by 48. Quotient $1328\frac{40}{48}$.
3. Divide 63784 by 72. " $885\frac{64}{72}$.
4. Divide 68734 by 16.
5. Divide 4866 by 33. " $147\frac{15}{33}$.

* See Q. 81. † Ibid. ‡ See Q. 82.

6. Divide 6784 by 25.
7. Divide 4866 by 64. Quotient $76\frac{2}{64}$.

NOTE VII.

83. How do you proceed to divide when the divisor does not exceed 121, and the right-hand figure is 1?

A. Cut off the right-hand figure of the divisor and also of the dividend; then divide as in short division, and subtract the last quotient figure each time from the number to be divided, till you arrive at the last quotient figure, which subtract from the entire remainder for the true remainder.

Remark.—When the last quotient figure cannot be subtracted from the next number to be divided, or when the last quotient figure cannot be subtracted from the entire remainder, it must be diminished by 1.

EXAMPLES.

1. Divide 24678 by 21.

2|1*)2467|8*
1175+3 remainder.
Quotient $1175\frac{3}{21}$.

We say 2 in 2 1 time. We then subtract this quotient figure (1) from the next number, which is 4; then we say 2 in 3, 1 time and 1 over, making the next number 16; 1 from 16 leaves 15: 2 in 15, 7 times and 1 over: 7 from 17 leaves 10; 2 in 10, 5 times, and this last quotient figure subtracted from 8 leaves 3 remainder.

2. Divide 45676 by 31. Quotient $1473\frac{13}{31}$.
3. Divide 78345 by 41. " $1910\frac{25}{41}$.
4. Divide 14678 by 51. " $287\frac{41}{51}$.
5. Divide 31642 by 61. Quotient 518+44 Rem.
6. Divide 21284 by 71.

7|1)2128|4
†299$\frac{55}{71}$

If we should say 7 in 21, 3 times, we could not subtract the quotient from the next number to be divided, because the quotient figure to be subtracted

* See Q. 88. † See Q. 83 and Remark.

would be 3 and the next number would be but 2; therefore, we diminish this quotient figure by 1, making it 2, and then proceed as before.

7. Divide 64746 by 81. Quotient $799\frac{27}{81}$.
8. Divide 45784 by 41.
9. Divide 45784 by 91. Quotient $503\frac{11}{91}$.
10. Divide 67382 by 101.
11. Divide 78642 by 111.
12. Divide 64384 by 121.
13. A man divided 504 peaches equally among 21 boys; how many did he give to each? *Ans.* 24.
14. A person took some apples to market and sold them for 41 cents a bushel. The apples came to 1025 cents; how many bushels were there? *Ans.* 25.
15. Sold a sufficient number of pounds of butter to come to 868 cents, at 31 cents a pound; how many pounds did I sell? *Ans.* 28.

The following notes afford excellent discipline of the mind, and when thoroughly learned, will be found of service in shortening operations.

NOTE VIII.

84. How do you proceed to multiply, when any figure or figures of the multiplier are contained as a factor in any other figure or figures of the multiplier?

A. Multiply the multiplicand by the divisor factor, and this product by the quotient factor, and add together the *partial* products.

REMARK.—The right-hand figure of the last partial product must occupy the same place in relation to the right-hand figure of the first partial product that the last factor does to the first factor.

EXAMPLES.

1. Multiply 4678 by 324.

Multiply the multiplicand (4678) by 3, and this product (14034) by 8, and add together the products.

The figure (3) at the left of the multiplier is contained in the figures (24) at the right of it 8 times. The prod-

4678* / 8*24
14034† / 8†
112272
1515672

uct of the multiplicand by the divisor factor (3) is 14034, and the product of this product by the quotient factor (8) is 112272. The quotient factor (8) stands two places to the right of the divisor factor (3), therefore the first figure of the product of this product by 8 must stand two figures to the right of the first or left-hand figure of the product of the multiplicand by 3. These two partial products added together as they stand give the total product.

2. Multiply 4863 by 848.

4863 / 848
/ 6

Product 4123824

8 in 48, 6 times. Multiply by 8 and by 6.

3. Multiply 34762 by 763. (7 in 63, 9 times.) Product 26523406.
4. Multiply 86474 by 864. (8 in 64, 8 times.) Product 74713536.
5. Multiply 63718 by 728. Product 46386704.
6. Multiply 2463 by 436. " 1073868.
7. Multiply 1674 by 525. " 878850.
8. Multiply 3627 by 954. " 3460158.
9. Multiply 4382 by 648. " 2839536.
10. Multiply 2041 by 642. " 1310322.
11. Multiply 1834 by 735. " 1347990.
12. Multiply 2463 by 832. " 2049216.
13. Multiply 1467 by 972. " 1425924.
14. Multiply 46387 by 279.

46387* / 279*
417483† / 3†
1252449

Product 12941973

In this example the right-hand figure (9) is contained in the two left-hand figures 27, 3 times. We, therefore, first multiply the multiplicand by 9, then this product by 3.

* See Q. 84. † Ibid.

15. Multiply 37634 by 567.

37634 / 567
/ 8

Product 21338478

7 in 56, 8 times. Multiply first by 7, then this product by 8.

16. Multiply 4678 by 324. (4 in 32 or 8 in 24.) Product 1515672.
17. Multiply 63718 by 728. " 46386704.
18. Multiply 3872 by 427. " 1653344.
19. Multiply 463 by 255. " 118065.
20. Multiply 874 by 637.
21. Multiply 2283 by 246. " 561618.
22. Multiply 847 by 243.
23. Multiply 467 by 248. " 115816.
24. Multiply 2684 by 2473.

2684* / 2473*
/ 8†
8052†
18788
64416
Product 6637532

The right-hand figure (3) is contained in the two left-hand figures 24, 8 times.

25. Multiply 7863 by 4937. (4937 / 7) 38819631.

26. Multiply 8467 by 4856. (Say 6 in 48 or 8 in 56.)

8467 / 4856
8
50802
42335
406416
41115752 Product.

or

8467 / 4856
/ 7
67736
33868
474152
41115752 Product.

27. Multiply 8463 by 6484. Product 54874092.
28. Multiply 2863 by 2424. Product 6939912.

* See Q. 84. † Ibid.

29. Multiply 3847 by 1224.

3847* / 12̄2̄4̄* (12 in 24, 2 times.)
46164† / 2†
92328
Product 4708728

30. Multiply 3846 by 1236. Product 4753656.
31. Multiply 6843 by 1248. " 8540064.
32. Multiply 2387 by 1272. " 3036264.
33. Multiply 26360 by 12144.

26360* / 12̄*1̄4̄4̄ (12 in 144, 12 times.)
31632† / 12†
379584
Product 320115840

34. Multiply 23840 by 12108. Product 288654720.
35. Multiply 24630 by 12096. " 297924480.
36. Multiply 46323 by 14412. " 667607076.
37. Multiply 32463 by 96012. " 3116837556.

NOTE IX.

35. How do you proceed to multiply when either figure of the multiplier is 1?

A. Omit multiplying by the 1, and consider the multiplicand its product, observing to let the products of the other figures occupy the same relation to it as they would if you actually multiplied by the 1.

REMARK.—This rule is based upon the principle that 1 time the multiplicand is the multiplicand; if the 1 occupies the place of tens in the multiplier, the first or right-hand figure of the multiplicand must occupy the place of tens in its relation to the first figure of the product of the other figure, &c.: hence it is evident that when there is more than one figure 1 in the multiplier, but one of these figures can be omitted in the operation.

---

* See Q. 84 and Remark. † Ibid.

EXAMPLES.

1. Multiply 374 by 13.

374*/13*
1122
Product 4862

We multiply by 3, and add the product and multiplicand together. The figure 3 in the multiplier stands one figure to the right of the 1, therefore the first or right-hand figure of the product of the figure 3 must stand one figure to the right of the multiplicand, which is to be considered as the product of the figure 1.

2. Multiply 3864 by 14. Product 54096.
3. Multiply 3786 by 15. " 56790.
4. Multiply 243 by 17.
5. Multiply 386478 by 16. " 6183648.
6. Multiply 683 by 18.
7. Multiply 784 by 19. " 14896.
8. Multiply 643 by 14.
9. Multiply 4637 by 21.

4637*/21*
9274
97377

In this example the figure 2 stands one figure to the left of the 1; therefore the first or right-hand figure of the product of 2 is set one figure to the left, under the multiplicand.

10. Multiply 478 by 61. Product 29158.
11. Multiply 387 by 31.
12. Multiply 684 by 41. Product 28044.
13. Multiply 783 by 71.
14. Multiply 1684 by 91 Product 153244.
15. Multiply 873 by 81.
16. Multiply 684 by 51. Product 34884.
17. Multiply 387 by 101.
18. Multiply 684 by 111.. Product 75924.
19. Multiply 384 by 121.
20. Multiply 784 by 165.

784*/165*
4704
3920
Product 129360

* See Q. 85.

21. Multiply 7863 by 146. Product 1147998.
22. Multiply 6843 by 187.
23. Multiply 384 by 196. Product 75264.
24. Multiply 284 by 175.
25. Multiply 387 by 132. Product 51084.
26. Multiply 846 by 168.
27. Multiply 384 by 157. Product 60288.
28. Multiply 387 by 189.
29. Multiply 467 by 127. Product 59309.
30. Multiply 678 by 317.

678*/317*
2034
4746
Product 214926

31. Multiply 684 by 212. Product 145008.
32. Multiply 387 by 314.
33. Multiply 2346 by 817. Product 1916682.
34. Multiply 1687 by 814.
35. Multiply 1234 by 718. Product 886012.
36. Multiply 634 by 621.

634*/621*
1268
3804
Product 393714

37. Multiply 7846 by 241. Product 1890886.
38. Multiply 6843 by 341.
39. Multiply 6843 by 761. Product 5207523.
40. Multiply 7843 by 2419.
41. Multiply 6847 by 3147. Product 21547509.
42. Multiply 2346 by 1384.
43. Multiply 6183 by 6781. Product 41926923.
44. Multiply 26478 by 27314.

REMARK 2.—This method will operate in connection with the preceding one.

---

* See Q. 55.

EXAMPLES.

1. Multiply 8647 by 1728.

8647*‡/17*28† (We say 7 in 28, 4 times.)
60529‡ /4‡
242116

Product 14942016

2. Multiply 3847 by 1624. Product 6247528.
3. Multiply 6848 by 1525.
4. Multiply 3876 by 1636. Product 6341136.
5. Multiply 2874 by 1872.
6. Multiply 3824 by 1864. Product 7127936.
7. Multiply 4378 by 1436.
8. Multiply 2874 by 1327. Product 3813798.
9. Multiply 128787 by 112144.

128787*‡/112*144† (12 in 144, 12 times.)
1545444‡ /12‡
18545328

Product 14442689328

10. Multiply 126840 by 112132.

Product 14222822880.

11. Multiply 46387 by 2791.

46387*‡/279‡1*
417483‡ /3‡
1252449

Product 129466117

12. Multiply 78634 by 3661. Product 287879074.
13. Multiply 3678 by 7218.

3678/7218
29424/9
264816

Product 26547804

14. Multiply 4678 by 2416.
15. Multiply 3874 by 27491. Product 106500134.

* See Q. 85. † See Q. 84. ‡ Ibid.

REMARK 3.—These last two methods will operate in connection with each other, when, after dropping 1 from any figure of the multiplier, any other figure or figures of the multiplier are contained as a factor in any other figure or figures of the multiplier. The multiplicand is to be considered the product of the 1 dropped, and being suffered to occupy its proper place, in relation to the products of the other figures, is to be added with them.

EXAMPLES.

1. Multiply 3432 by 325.

1*
3432*† / 325
10296‡ / 8‡
82368
Product 1115400

We drop 1 from 5, and say 3 in 24, 8 times. The figure 8 stands directly under the 1 dropped; therefore the first figure of the product of 8 must stand directly under the first or right-hand figure of the multiplicand.

2. Multiply 7634 by 437. (4 in 36.)
Product 3336058.

3. Multiply 8673 by 536. (5 in 35.)
Product 4648728.

4. Multiply 6378 by 496. (Drop 1 from 9, and say 6 in 48.)

1*
6378*† / 496
38268‡ / 8‡
306144
Product 3163488

5. Multiply 76483 by 376. Product 28757608.

REMARK 4.—When there are ciphers in either the multiplier or multiplicand or both, in connection with the last two methods of shortening operations, they are to be treated as formerly.

1. Multiply 647 by 102. (The cipher is omitted in the operation.)

647 / 102
1294
65994

* See Q. 85. † See Q. 84. ‡ Ibid.

2. Multiply 6783 by 1004.

6783*/10*0†4
27232
Product 6810132

3. Multiply 8463 by 108.
4. Multiply 7864 by 1006. Product 7911184.
5. Multiply 6347 by 7001.

6347*/70†01-
44429
44435347

6. Multiply 7843 by 8001.
7. Multiply 4638 by 3001. Product 13918638.
8. Multiply 6783 by 3024.

6783‡/30‡24
20349§ /8§
162792
Product 20511792

9. Multiply 8467 by 8032.
10. Multiply 6438 by 2703. Product 17401914.
11. Multiply 2468 by 40036.
12. Multiply 8672 by 3025.

1*
8672*‡/30‡25
26016§ 8§
208128
Product 26232800

13. Multiply 8472 by 4025.
14. Multiply 7863 by 6037. Product 47468931.
15. Multiply 8627 by 3706.

1*
8627*‡/3706
51762§/6§
310572
Product 31971662

---

* See Q. 85. † See Q. 77, Rem. ‡ See Q. 84. § Ibid.

16. Multiply 2463 by 4306.

17. Multiply 63846 by 16024.

63846*‡/16*0‡24
3830760 /48
1532304

Product 1023068304

GENERAL EXAMPLES IN MULTIPLICATION AND DIVISION.

1. What will 373 pounds of cheese come to, at 9 cents a pound? *Ans.* 3357 *cents.*

2. What will 654 pounds of butter come to, at 14 cents a pound? *Ans.* 9156 *cents.*

3. What will 487 bushels of oats come to, at 31 cents a bushel? *Ans.* 15097 *cents.*

4. What will 437 barrels of flour come to, at 636 cents or 6 dollars and 36 cents a barrel?

Ans. 277932 *cents,* or 2779 *dollars* and 32 *cents.*

5. What will 4763 tons of coal come to, at 254 cents a ton? *Ans.* 1209802 *cents.*

6. What number is that, the divisor of which is 16524 and the quotient 23647? *Ans.* 390743028.

7. What number is that, which, if divided by 34687, the quotient will be 19372? *Ans.* 671956564.

8. If a man can count 36483 dollars in one day, how many dollars could one man count in 28471 days?

Ans. 1038707493 *dollars.*

9. What is the product of 46387 multiplied by 2386?

Ans. 110679382.

10. A father being worth 2304 dollars, and having 6 children, divided his estate so that they shared equally. How many dollars did each child receive?

Ans. 384 *dollars.*

11. If 4380 dollars be divided equally among 12 men, how many dollars will each one receive?

Ans. 365 *dollars.*

---

* See Q. 85. † See Q. 77, Rem. ‡ See Q. 84. § Ibid.

12. If a farm containing 436 acres be worth 38368 dollars, how much is it worth per acre?

Ans. 88 *dollars.*

13. How many times must a carriage-wheel, 15 feet in circumference, turn round in running the distance of 63360 feet? *Ans.* 4224 times.

14. A man sold 35 horses for 2975 dollars; how much did he receive for each horse at that rate?

Ans. 85 *dollars.*

15. How many men can share in 1273240 dollars, allowing 695 dollars for each man? *Ans.* 1832 *men.*

16. If the product of two numbers be 1232, and the multiplicand 44, what is the multiplier? *Ans.* 28.

17. If the divisor be 28 and the dividend 1232, what is the quotient? *Ans.* 44.

EXAMPLES TO EXERCISE THE PUPIL IN THE PRECEDING RULES.

1. A man bought a horse for 175 dollars, and a wagon for 250 dollars; what did they both cost him?

Ans. 425 *dollars.*

2. A man gave 4300 dollars for a farm, and expended on it in repairs 760 dollars; for how much must he sell it, to gain 500 dollars? *Ans.* 5560 *dollars.*—To gain 1000 dollars? *Ans.* 6060 *dollars.*—To gain 700 dollars? *Ans.* 5760 *dollars.*

3. A man bought a horse for 75 dollars, and a wagon for 160 dollars; how much more did he give for the wagon than for the horse? *Ans.* 85 *dollars.*

4. The sum of two numbers is 3684, and the less number is 1632; what is the greater? *Ans.* 2052.

5. A man starts from Boston Tuesday morning, and travels by railroad 400 miles a day; another starts from the same place Wednesday morning, and travels 150 miles a day; how far apart will they be Wednesday night?

Ans. 650 *miles.*

6. If the sum of two numbers is 36, and one of them 18, what is the other? *Ans.* 18.

7. A man bought 8 cows, at 25 dollars each; how much must he give for them besides a 20-dollar note?
Ans. 180 *dollars.*

8. What must I pay for 18 pounds of butter, at 13 cents a pound? *Ans.* 234 *cents.*—At 15? *Ans.* 270 *cents.*

9. What is the product of 824 and 636?
Ans. 524064.

10. How many square feet in a board 18 feet long and 2 feet wide? *Ans.* 36 *square feet.*

11. How many square feet in a board 12 feet long and 3 feet wide? *Ans.* 36 *square feet.*

12. How many square miles in 10 miles square?
Ans. 100 *square miles.*

13. How many square miles in 6 miles square?
Ans. 36 *square miles.*

14. How many square rods in a field 60 rods long and 36 rods wide? *Ans.* 2160 *square rods.*

15. How many tons of hay can you buy for 864 dollars, at 8 dollars a ton? *Ans.* 108 *tons.*

16. A father divided 24000 dollars equally among his four sons; how much did each receive?
Ans. 6000 *dollars.*

17. If a man receive 288 dollars a year for his wages, what is that a month, allowing but 12 months to the year, or reckoning calendar months? *Ans.* 24 *dollars.*

18. If a farm of 120 acres is rented for 480 dollars, how much is that per acre? *Ans.* 4 *dollars.*

19. A man sold 900 sheep for 2700 dollars; how much is that per head? *Ans.* 3 *dollars.*

20. If a carriage-wheel in turning round 324 times goes 1 mile, how many miles will it go in turning round 30780 times? *Ans.* 95 *miles.*

21. The product of two numbers is 17246663, and one of the numbers is 4729; what is the other number?
Ans. 3647.

22. If the dividend be 17246663 and the quotient 3647, what is the divisor? *Ans.* 4729.

23. The exports of specie from the United States to Buenos Ayres in one week was 2322 dollars; to Havana,

13312 dollars; to London, 108365 dollars; to Havre, 252746 dollars; to Santa Mariha, 541 dollars; to St. Domingo, 2301 dollars; to Port au Prince, 1100 dollars. What was the total amount of specie exported to those places from the United States in a week?

Ans. 380687 *dollars.*

24. If the amount of specie exported to the above places from the United States should average 380687 dollars a week, what would the specie exported to those places amount to in 52 weeks?

25. From the 1st of January to September 30th (1848) the specie exported to the above-mentioned places was 8947403 dollars; how many dollars would that be on an average a month? *Ans.* 994155$\frac{3}{9}$ *dollars.*

26. The population of Russian America is stated to be fifty thousand; that of Greenland twenty thousand; that of British America one million six hundred and ninety thousand; that of the United States twenty-three million; that of Mexico, including Yucatan, seven million three hundred and forty thousand; that of Guatimala two million; and that of the West Indies three million three hundred and eighty-four thousand. What is the total population of these several divisions of North America?

Ans. 37484000.

27. From seven million and fourteen take three thousand and forty-six. *Ans.* 6996968.

TO THE PUBLIC.

This work has been prepared by one who for several years was engaged in the instruction of youth, and is designed to supply a desideratum in this department of Mathematics. A great amount of labor has been expended on the fundamental rules of Arithmetic, with a view to simplify and bring them down to the understanding of the most obtuse mind. References and illustrations are given, rendering the pupil, to a great extent, independent of the aid of the teacher. Notes are inserted after the general rules, containing short methods of multiplying, which afford an increased facility in performing operations, and a clear perception of the value of figures in their different relations. Thus far the work seems to be favorably received.

It is now stereotyped. Orders will meet with prompt attention, by addressing the author at "Kinderhook Depot, Niverville Post Office, Columbia Co., N. Y." Agents and Booksellers will be supplied at a liberal discount.

July 5th, 1852.